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A NEW SPECIES OF THE GENUS *NOTHOBRANCHIUS* PETERS, 1868 FROM THE LUFWA RIVER BASIN, KATANGA PROVINCE, DEMOCRATIC REPUBLIC OF CONGO

(PISCES, CYPRINODONTIFORMES, APLOCHEILIDAE)

INTRODUCTION

The fish fauna of the Katanga province (previously known as Shaba, in the former Republic of Zaire) in the Democratic Republic of Congo has been the subject of several studies (Poll, 1933; 1938; 1976). *Nothobranchius brieni*, the first species of the Cyprinodontiform genus *Nothobranchius* known from this province, was described by Poll (1938) from Bukama on the Lualaba River. Since then this species was recorded from the Luapula River system (Jackson, 1961; Tait, 1965; Malaisse, 1976), the upper Lufira River system (Magis, 1963) and the Lake Upemba system, Lufira basin (Poll, 1976).

Wildekamp (1978a, b) showed that most of these specimens, identified as *Nothobranchius brieni*, were in fact distinct and described three new species: *Nothobranchius polli* Wildekamp, 1978 from the upper Lufira River, *N. malaissei* Wildekamp, 1978 originating from the Luapula system, south of Lake Mweru, and *N. symoensi* Wildekamp, 1978 from the upper Luapula system. Apart from minor differences in morphology, these species were mainly distinguished on the basis of male coloration, a method frequently used in the discrimination of the family Aplocheilidae species.

In June and August 2002 game wardens of the 'Parc National de l'Upemba' (Upemba National Park) collected specimens of a *Nothobranchius* species in temporary pools in the upper Lufwa River catchment (Lufira system). The purpose of the present study is to compare

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these upper Lufwa River specimens with the other known Katangan *Nothobranchius* species and to describe them, on the basis of male coloration and morphological differences, as a new taxon.

MATERIALS AND METHODS

The description is based on specimens collected and preserved in the field by game wardens (guards) of the 'Parc National de l'Upemba'.

Measurements have been taken by means of a digital calliper, partly under a dissecting microscope. Counts were taken as described in AMIET (1987). All visible rays of the dorsal- and anal-fins were counted. The count of scales on the median longitudinal series is the number of scales between the superior junction of the opercular membrane and the base of the caudal fin. Measurements are presented in percentages of standard length (SL). Sub-units of the head are presented in percentages of head length (HL). Terminology for the cephalic neuromast series follows SCHEEL (1968).

Abbreviations for the institutions are: MRAC, Musée Royal de l' Afrique Centrale, Tervuren (Belgium); MSNG, Museo Civico di Storia Naturale "Giacomo Doria", Genova (Italy).

Nothobranchius hassoni n. sp.

(Figs. 1-2)

Holotype. MSNG 51837, ♂, 41.63 mm SL; Democratic Republic of Congo, Katanga Province: Kanvungwe, ephemeral pool in the Lufwa river floodplain 09°28'39.4" S; 27°17'04.9" E; Game warden staff of 'Parc National de l'Upemba', 17.VI.2002.

Paratypes. MSNG 51838, 51839 and 51840, three ♂♂, 34.65-37.95 mm SL, same collecting data as holotype; MSNG 51841 and 51842, two ♂♂, 27.04-33.13 mm SL (note: after measuring, the dorsal- and caudal-fins were cut from the MSNG 51842 specimen for mDNA analysis (VALDESALICI *et al.,* in prep.)); MSNG 51843, ♀, 27.39 mm SL, collected 27.VIII.2002 (other data as holotype); MSNG 51844, ♀, 36,60 mm SL; MSNG 51845 and 51846, two ♂♂, 32.90-32.92

mm SL, Lwipa: ephemeral pool in the Lwipa river, 9°08’24.4” S; 27°19’35.9” E; Game warden staff of ‘Parc National de l’Upemba’, 20.VI.2002; MRAC A3-28-P-1, ♂, 41.28 mm SL (other data as holotype); MRAC A3-28-P2, MRAC A3-28-P3, two ♂♂, 29.91-30.65 mm SL, 27.VIII.2002 (other data as holotype); MRAC A3-28-P-4, ♂, 33.98 mm SL, Lwipa: ephemeral pool in the Lwipa river, 9°08’24.4” S; 27°19’35.9” E; Game warden staff of ‘Parc National de l’Upemba’, 20.VI.2002.

Diagnosis. *Nothobranchius hassoni* is distinguished from all other species of the genus by the following combination of unique characters: absence of ctenii on the rays of the dorsal and anal fins and no ctenii on the body scales, male coloration consisting of an alternating pattern in anal- and caudal-fins comprising of traverse bands in a combination of more than two colours.

Description. Morphometric characters are given in Table 1. Deep bodied *Nothobranchius*, snout rounded, mouth terminal, directed upward. Dorsal-fin rays 15-17 (mean 15.8), anal-fin rays 15-17 (mean 15.6), D/A = 0/-2. Scales on the median longitudinal line 26-30 + 2-4 on caudal-fin base, most with a shallow pit in centre, not connected with an underlying neuromast system. Transverse rows of scales above pelvic-fins 11-12; scale rows around caudal peduncle 16. Supra-orbital squamation variable, but most studied specimens show the G-type in the sense of HOEDEMAN (1958).

Frontal part of supra-orbital squamation partly covered with epidermal tissue. Frontal part of supra-orbital neuromast system ‘open’ and not fused with the central system. Central supra-orbital neuromast system and consisting of two parallel shallow grooves, lined with low lobes. Posterior cephalic neuromast system in two grooves curved to an angle of about 90°. Preopercular neuromast series in an open-groove, its distal edge slightly overlapping the opercle.

Males maximum size observed: 41.63 mm SL. Body laterally compressed and deep. Dorsal profile slightly convex, in older males more convex than in younger specimens. All unpaired fins rounded, the dorsal and anal fin covered with epidermal tissue. Opercular membrane projecting from opercle, distal edge slightly wrinkled. No ctenii found on the rays of the dorsal and anal fins and no ctenii on the body scales of the studied specimens.

Females smaller than males, maximum size observed: 36.60 mm SL. Body less deep than in males. Dorsal and caudal fin rounded, anal

Table 1 - Morphometric characters of *Nothobranchius hassoni*.

			In percents of standard lenght						In percents of head lenght		
Code	SL (mm)	Population	Depth of caudal peduncle	Depth at the pelvic fins	Preanal length	Predorsal length	Prepelvic length	Head length	Interorbital width	Snout length	Eye diameter
Holotype MSNG 51837	41,63	Kanvungwe	13,81	30,17	57,22	56,21	47,87	30,80	39,86	21,53	33,00
MSNG 51838	35,18	Kanvungwe	13,76	32,80	57,33	52,87	49,57	29,76	30,56	21,39	30,56
MRAC A3-28-P-1	41,28	Kanvungwe	11,77	28,61	54,82	54,65	39,73	30,09	39,05	26,17	25,93
MSNG 51839	37,95	Kanvungwe	12,04	31,86	57,34	53,57	45,88	31,70	38,90	25,10	25,77
MSNG 51840	34,65	Kanvungwe	14,37	28,98	58,27	53,28	47,27	32,53	39,84	26,35	30,26
MRAC A3-28-P-2	29,91	Kanvungwe	13,07	29,02	61,85	53,33	47,64	31,56	30,30	26,91	29,87
MSNG 51841	33,13	Kanvungwe	14,34	30,79	61,18	55,84	50,11	32,66	36,60	23,29	28,28
MRAC A3-28-P-3	30,65	Kanvunqwe	13,47	29,14	57,75	54,45	47,34	30,93	40,30	25,32	28,48
MSNG 51842	27,04	Kanvungwe	15,05	30,92	60,10	54,18	50,85	35,39	35,74	20,27	30,83
MSNG 51843	27,39	Kanvungwe	11,28	24,10	64,33	56,48	51,44	30,85	34,67	24,26	34,20
MSNG 51844	36,60	Lwipa	12,54	28,33	62,16	57,73	49,18	33,25	39,85	23,34	25,97
MSNG 51845	32,92	Lwipa	15,58	32,84	59,33	56,11	48,33	33,17	36,90	25,64	25,92
MRAC A3-28-9-4	33,98	Lwipa	14,16	31,43	55,97	53,38	45,35	32,20	38,03	24,77	28,34
MSNG 51846	32,90	Lwipa	15,35	33,07	58,66	56,41	56,57	32,77	38,87	22,63	25,70

fin triangular, tip rounded, rays 3-8 longer and more rigid. Anal fin positioned more posteriorly than in male. No epidermal tissue covering the dorsal and anal fins. Opercular membrane not projecting from the opercle.

Coloration. Living males (Fig.1). Body and head scales iridescent light blue. Most scales with a distinct dark red-brown margin. Other scales without red-brown margin, or with narrow margin, creating an irregular reticulated pattern. In young specimens (< 35 mm SL) red-brown margins may form chevron-shaped cross-bars, most distinct on central part of sides. Adult specimens have more dark red-brown and more distinct margins at the body scales.

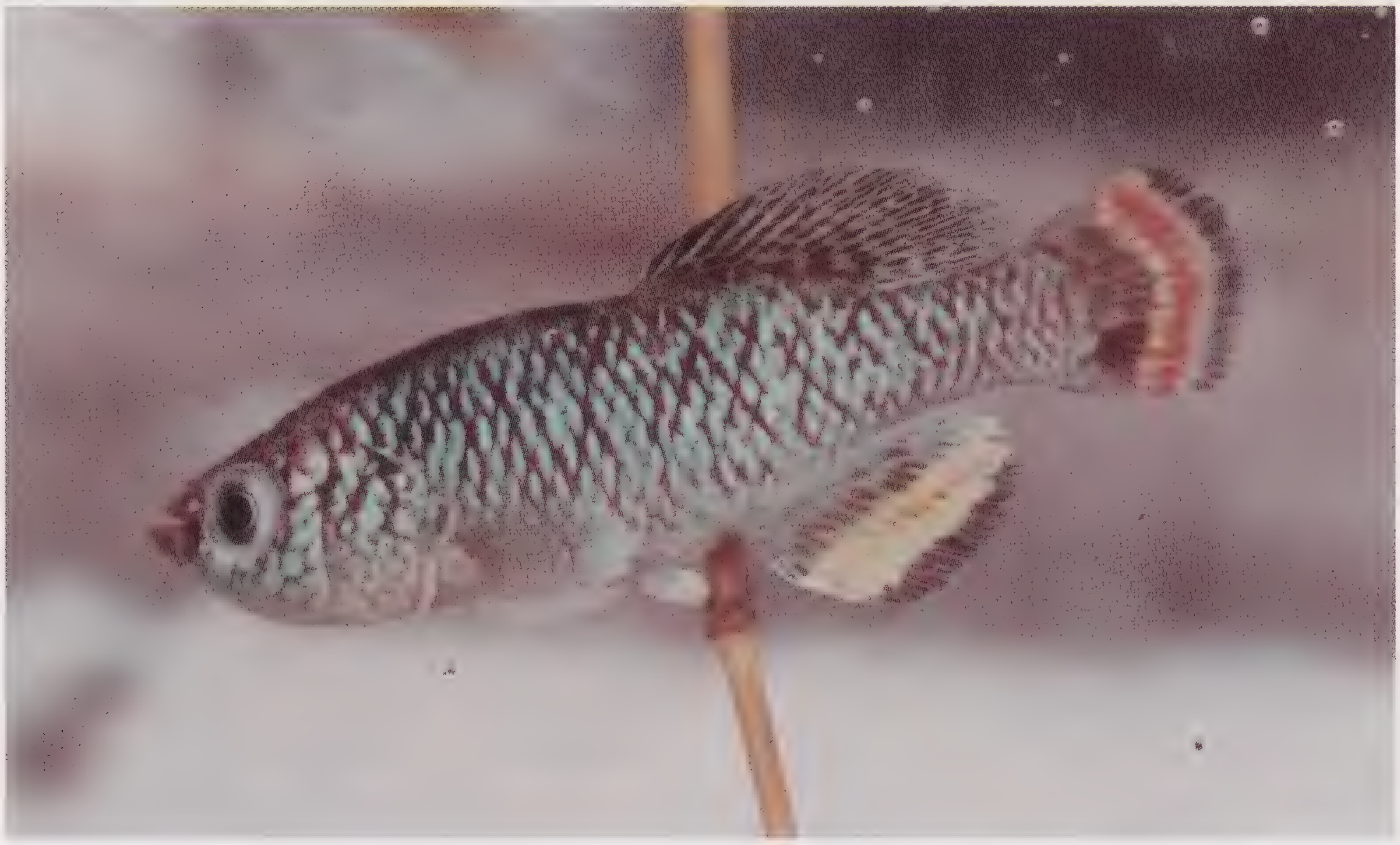

Fig. 1 - *Nothobranchius hassoni*, wild caught subadult male, MSNG 51841, 33.13 mm SL, Democratic Republic of Congo, Lufwa river floodplain. (Photo: Michel Hasson)

Dorsal-fin light blue-grey with a pattern of dark brown spots. Proximal spots more distinct and larger than the distal. Black spots on membrane between first four fin-rays. Dorsal and anal fins with an alternating pattern of bands which may vary in width. Proximal band usually light blue grey, followed by red-brown, light yellow-orange,

orange-red, light yellow-orange respectively and dark brown margin. Pelvic fin hyaline at base, followed distally by parallel red-brown and light yellow bands and brown margin. Sub-adult specimens with hyaline pelvic-fins. Pectoral-fins colourless with light blue margin. Eye-iris silver with faint dark vertical bar.

Male coloration may vary somewhat on population level.

Living females (Fig.2). Body pale olive-brown grading to golden-white on abdomen. Unpaired and paired fin hyaline. Eye-iris silver, with faint dark vertical bar.

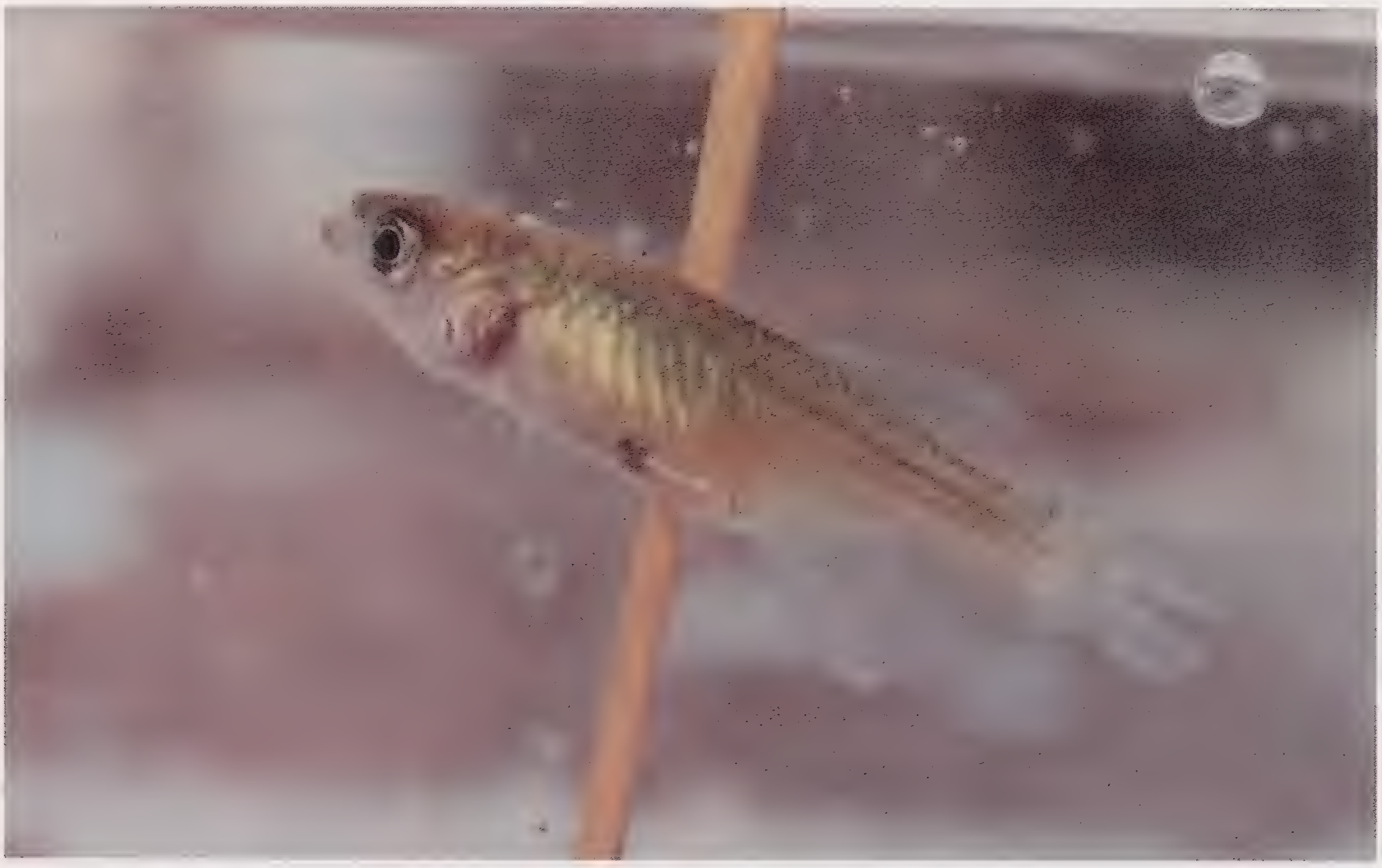

Fig. 2 - *Nothobranchius hassoni*, wild caught subadult female, MSNG 51843, 27,39 mm SL; Democratic Republic of Congo, Lufwa river floodplain. (Photo: Michel Hasson)

Distribution and ecology. *Nothobranchius hassoni* is presently only known from ephemeral pools from the floodplain of the Lufwa river system (lower Lufira basin) (Figs. 3, 4). Specimens were collected from three localities, all containing turbid water: Kanvungwe (9°28’39.4” S; 27°17’04.9” E, altitude 882 m), Lwipa (9°08’24.4” S; 27°19’35.9” E, altitude 1.060 m) and Kanjingi (9°11’58,3” S; 27°16’53,9”E; altitude 1.026 m). The only other fishes present in the pools were indicated by the collectors as small 'silures' (presumably *Clarias* sp.) and 'sardines' (*Barbus* sp.). The *Nothobranchius* specimens were collected in the grasses at the edges of the pools.

Kanvungwe locality is a small pool (about 36 x 10 m in size) situated in a flat plain (approximately 7 x 3 km) that is seasonally flooded by the Lufwa river. The vegetation present consisted mainly of grasses and scattered bushes. The pools itself did not contain aquatic vegetation.

Lwipa locality is a small pool (12 x 5 m) in the Lwipa river. The Lwipa is a small seasonal river that in the dry season consists in a series of pools only. The Lwipa is a tributary of Kana river wich goes in the Kabwe river (that is connected to Mwela) and subsequently into Lufwa river.

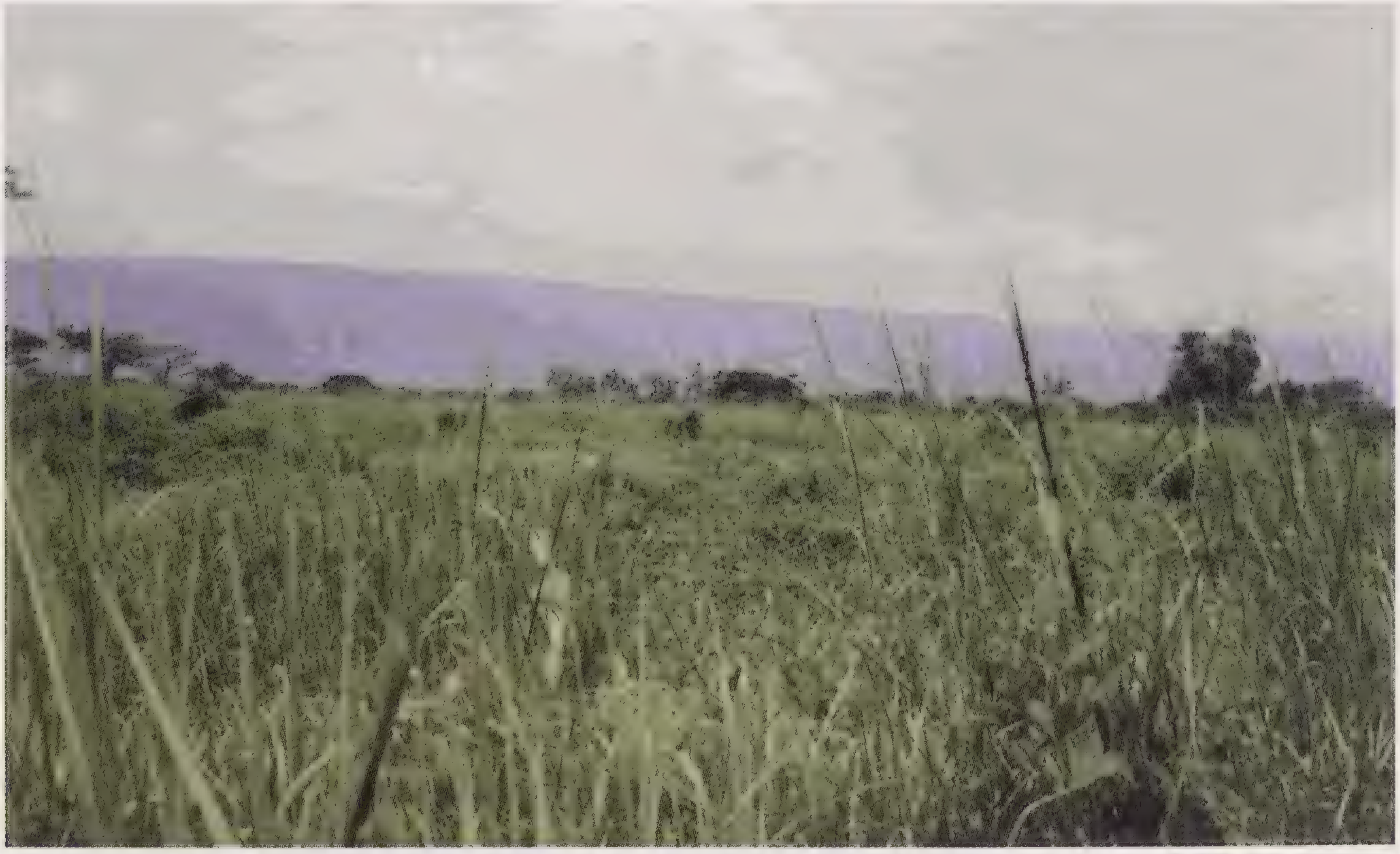

Fig. 3 - Type locality of *Nothobranchius hassoni*. Democratic Republic of Congo, ephemeral pool Kanvungwe, Lufwa river floodplain. (Photo: Game warden staff, Parc National de l'Upemba)

Kanjingi is the third locality where *Nothobranchius hassoni* has been collected but not preserved. This locality is a pool (28 x 8 m) in the Kanjingi river. The Kanjingi is a small seasonal river that in the dry season consist in few pools only. The Kanjingi is a tributary of Kafwe river that empties into Lufwa river. The vegetation present consisted mainly in grasses but also Nymphaeaceae and Cyperaceae.

Like all other presently known *Nothobranchius* species, *N. hassoni* is annual in its reproduction. This means that the eggs are deposited in the bottom substrate, which consists of silt and clay with high humus contents. In the substrate they survive the dry season. Although not yet known for *N. hassoni*, the developing eggs of *Nothobranchius* spp. undergo three periods of arrest, called diapauses. It is not obligatory that all eggs undergo all three diapauses. Occasionally periods of development merge without distinct interrupting period of arrest (PETERS, 1963). The eggs hatch, within a short time, with the onset of the next rains.

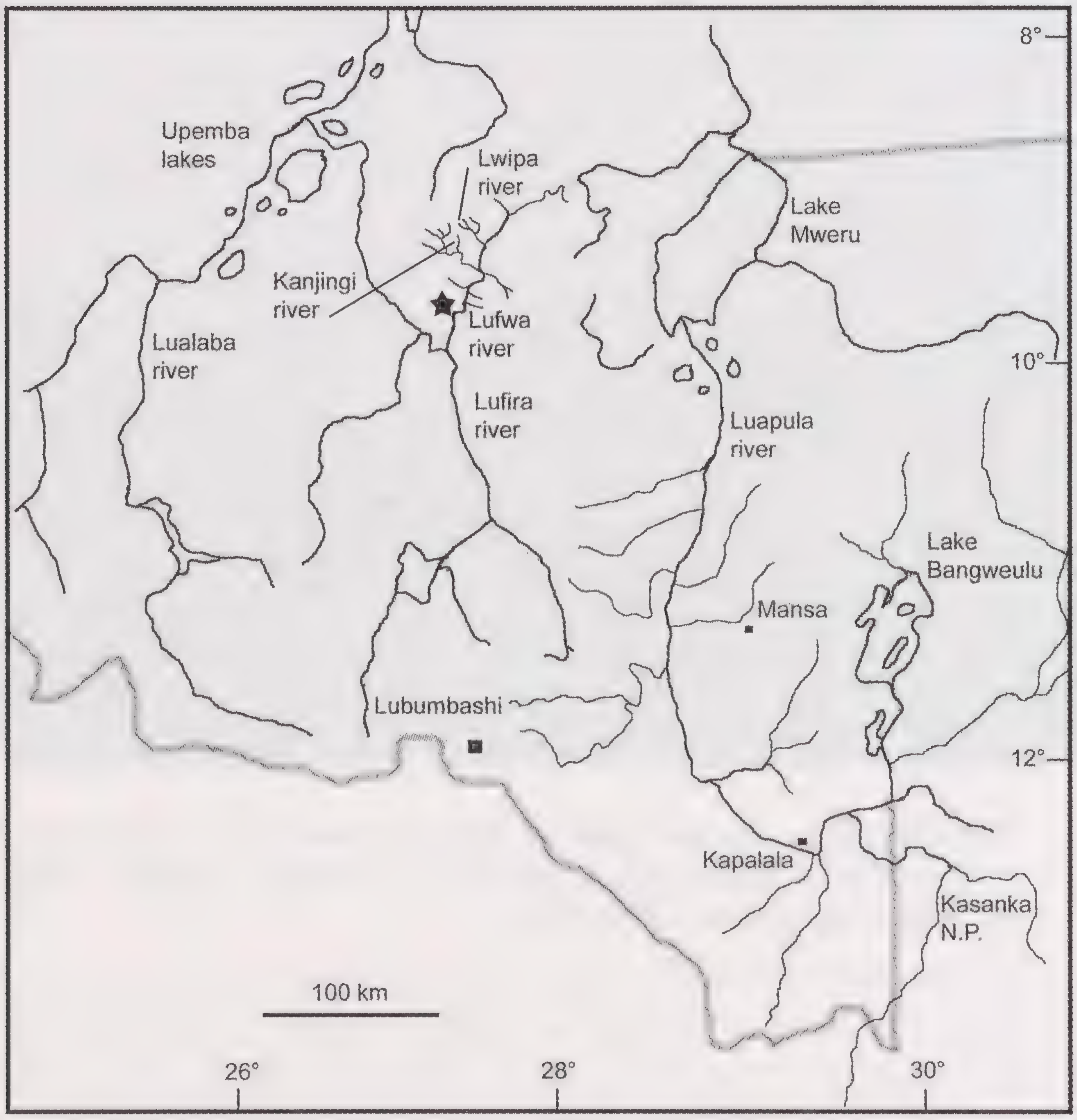

Fig. 4 - Map showing part of Katanga province, southeastern Democratic Republic of Congo, including Lufwa River system. The star indicates the type locality of *Nothobranchius hassoni*, the end of the lines indicate the river names and the respective localities.

Local people, in Kibemba language, name these fishes 'Sangumalala'. As their appearance from 'nowhere' has something magic to them, specimens are refused to be taken for consumption.

Etymology. The new species is named in honour of Michel Hasson (Brussels, Belgium), for his assistance to obtain the type specimens, additional information and for his support to help the National Park of Upemba.

DISCUSSION

Nothobranchius hassoni differs from all known species of the genus by the absence of ctenii on the rays of the unpaired fins and body scales. It can be distinguished from the other *Nothobranchius* spp. in the area by meristics, morphometrics, male coloration and pattern.

N. hassoni differs from *N. brieni* by reduced number on anal fin rays (average less than 16 vs. average more than 17) and total maximum size (less than 50 mm vs. 60 mm). Specimens of the equal size show reduced dimension in head length, eye diameter, interorbital width and snout length. *N. hassoni* also differs from *N. brieni* for complete vertical band and dark margin in the caudal-fin vs. very spotted with a light triangular lower lobe at the lower distal edge.

Males of *N. hassoni* differ from males of *N. malaissei* in colour pattern (no spots vs. red spots on the lower parts of the head and throat) and transverse band in the caudal-fin (vs. spotted caudal-fin) (See illustration of *N. malaissei* in MALAISSE, 1997).

Males of *N. hassoni* differ from males of *N. symoensi* by reduced number of dorsal and anal fin rays (15-17 vs. 17-18) and coloration (dark brown margin at anal and caudal fins vs. light blue margin at all unpaired fins; banded caudal and anal fins vs. spotted).

Males of *N. hassoni* differ from those of *N. polli* by coloration and pattern of caudal- and dorsal-fin (light submarginal band yellowish with median orange-red band vs. light blue-white submarginal band) and absence of margin at the dorsal-fin (vs. presence of light blue margin).

Males of *N. hassoni* share with those of *N. brieni*, *N. malaissei* and a still unidentified species (known from Kasanka National Park, Mansa and the area north of Kapalala in Zambia) the presence of some black spots on the membrane between the first three to four dorsal-fin rays. These spots are absent in males of *N. polli* and *N. symoensi*; they are also known to exist in most populations of the Tanzanian *N. taeniopygus* Hilgendorf, 1891 and may suggest a close relation.

Based on similarities in male coloration, *N. hassoni* is regarded as closely related to *N. brieni* with which it shares the pattern of the anal fin. The triangular spot at the lower distal part of the caudal fin, distinct for *N. brieni*, is regarded as a relict of the vertical band present in the caudal fin of *N. hassoni*.

Comparative material. *N. brieni* Poll: MRAC 50.016-39, lectotype and 23 paralectotypes, Zaire, Shaba, Bukama; *N. malaissei* Wildekamp: MRAC 73-24-P-952, holotype; MRAC 73-24-P-914 to 919, 6 paratypes; MRAC 73-24-P-947 to 951, 5 paratypes, Zaire, Shaba, Kabiashia; *N. polli* Wildekamp: MRAC 192.399, holotype; MRAC 192.257 to 192.267, 11 paratypes, MRAC 192.400-405, 6 paratypes, Zaire, Shaba, Mwadingusha; *N. symoensi* Wildekamp: MRAC 73-25-P-1108 and 1109, holotype and paratype, Zaire, Shaba, Mufumbi.

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ABSTRACT

Nothobranchius hassoni, new species, is described from ephemeral pools in the Lufwa River basin, Katanga, Democratic Republic of Congo. Differences between *N. hassoni* and the presently known species of the genus in the Katanga province are presented as well as information on its known distribution.

RIASSUNTO

Una nuova specie del genere *Nothobranchius* Peters, 1868 del bacino del fiume Lufwa, nella provincia di Katanga, Repubblica Democratica del Congo (Pisces, Cyprinodontiformes, Aplocheilidae).

Nothobranchius hassoni è descritto sulla base di esemplari rinvenuti in pozze stagionali nel bacino del fiume Lufwa, in Africa centrale, ed è confrontato con le altre specie del genere attualmente conosciute nella provincia di Katanga.